IN THE SPECIFICATION

Please replace paragraph **[0003]** of the specification with the following amended paragraph:

[0003] Fuel cells are composed of an anode side and a cathode side, each having a channel system for fluids. A ~~diaphragm electrode unit (DEU)~~ membrane electrode assembly (MEA) separates the anode side from the cathode side. For generating electric power, the channel systems may be supplied with specific gases. In a preferred embodiment of a fuel cell, hydrogen flows through the anode space and a compressor makes oxygen or air flow through the cathode space. If hydrogen is produced from a hydrocarbon in a reformer unit situated upstream from the anode side of the fuel cell, this may take place using a low-pressure system or a high-pressure system. In low-pressure systems, the anode side of a fuel cell is directly flushed by the reformer gas flow.

Please replace paragraph **[0004]** of the specification with the following amended paragraph:

[0004] Hydrogen separation technologies, in particular diaphragm modules, are used in high-pressure systems in which pure hydrogen is separated from a gas mixture via separation diaphragms. The greater the pressure differential between the two sides of the particular diaphragm and the thinner the foil-type diaphragm, the more efficiently operate the separation diaphragms. The danger in the case of high-pressure differentials and thin foils is that the diaphragm ruptures, so that pressure compensation takes place between the high-pressure area of the reformer unit and the anode space of the fuel cell. However since the cathode side still remains on the compressor pressure level, a pressure differential is established across the ~~diaphragm electrode unit~~ membrane electrode assembly. The ~~diaphragm electrode unit~~ membrane electrode assembly may be damaged if this pressure differential exceeds a design-specific value, which may result in complete failure of a fuel cell.

Please replace paragraph **[0011]** of the specification with the following amended

paragraph:

[0011] The present invention provides a method for controlling a fuel cell system in which hydrogen-containing reformer gas is produced in a reformer unit by selectively separating the reformer gas from a gas mixture using a diaphragm module. In normal operation of the fuel cell system having a diaphragm, the gas mixture is kept under a higher pressure than the separated reformer gas, the reformer gas being supplied to the anode side of a fuel cell module made up of at least one fuel cell. An oxidation agent is supplied to the cathode side of the fuel cell module, the fluids on the anode side and the cathode side are separated in normal operation by a ~~separation diaphragm~~ membrane electrode assembly and held under predefined pressures. In the event of malfunction, e.g., bursting of the diaphragm, of the reformer unit, the differential pressure between the side of the reformer unit diaphragm facing the anode side and the cathode side of the fuel cell module is held below a predefined value.

Please replace paragraph **[0012]** of the specification with the following amended paragraph:

[0012] The present invention also provides a system for executing the method includes a reformer unit for producing a hydrogen-containing reformer gas using a diaphragm module which contains a diaphragm which separates a high-pressure area from a low-pressure area, including a fuel cell module having at least one fuel cell which is composed of an anode side and a cathode side which are separated from one another by a ~~separation diaphragm~~ membrane electrode assembly, the anode side being connected to the low-pressure area of the diaphragm module, and the cathode side being connected to a device for supplying an oxidation agent, wherein the volume for the circulation of fluids on the high-pressure side (15) is substantially smaller than the volume for the circulation of fluids on the low-pressure side (16).

Please replace paragraph **[0013]** of the specification with the following amended paragraph:

[0013] In addition, the present invention provides a system for executing the method comprising a reformer unit for producing a hydrogen-containing reformer gas using a diaphragm module which contains a diaphragm which separates a high-pressure area from a low-pressure area, including a fuel cell module having at least one fuel cell which is composed of an anode side and a cathode side which are separated from one another by a ~~separation diaphragm~~ membrane electrode assembly, the anode side being connected to the low-pressure area of the diaphragm module, and the cathode side being connected to a device for supplying an oxidation agent, wherein a pressure relief valve (29) is situated in the connection (21) between the low-pressure area (16) of the diaphragm module (4) and the anode side (18) of the at least one fuel cell (2).

Please replace paragraph **[0014]** of the specification with the following amended paragraph:

[0014] The present invention furthermore provides a system for executing the method, comprising a reformer unit for producing a hydrogen-containing reformer gas using a diaphragm module which contains a diaphragm which separates a high-pressure area from a low-pressure area, including a fuel cell module having at least one fuel cell which is composed of an anode side and a cathode side which are separated from one another by a ~~separation diaphragm~~ membrane electrode assembly, the anode side being connected to the low-pressure area of the diaphragm module, and the cathode side being connected to a device for supplying an oxidation agent, wherein a bursting disk (36) is situated in the connection (21) between the low-pressure area of the diaphragm module (4) and the anode side (18) of the at least one fuel cell (2).

Please replace paragraph **[0015]** of the specification with the following amended paragraph:

[0015] In the method according to the present invention, the pressure conditions in a reformer unit, as well as in the connected fuel cells, are taken into account. Due to the fact that in the event of malfunction, i.e., bursting of the reformer unit diaphragm, the differential pressure between the side of the reformer unit diaphragm facing the anode side and the cathode side of the

fuel cell module is held below a predefined value, mechanical damage to the ~~diaphragm electrode units~~ membrane electrode assemblies may be prevented.

Please replace paragraph **[0016]** of the specification with the following amended paragraph:

[0016] In an advantageous system for executing the method, the volume for the circulation of fluids on the high-pressure side of a reformer unit is substantially smaller than the volume for the circulation of fluids on the low-pressure side of the reformer unit and the fuel cell. In the event of a breakthrough of the reformer unit diaphragm, the pressure, volume, and temperature are equalized in the overall system composed of the high-pressure side and the low-pressure side including the anode space of the fuel cells. The mixture pressure established is always lower than the critical overpressure toward the cathode side of the particular fuel cell, so that the ~~diaphragm electrode units~~ membrane electrode assemblies between the anode sides and the cathode sides of the fuel cells are not damaged. A small volume on the high-pressure side is advantageous for the system dynamics. A large volume on the low-pressure side may advantageously be used as a hydrogen buffer for load change conditions.

Please replace paragraph **[0017]** of the specification with the following amended paragraph:

[0017] In a further advantageous system for executing the method, a pressure relief valve is situated in the connection between the low-pressure area of the diaphragm module of a reformer unit and the anode side of at least one fuel cell. In the event of rupture of the reformer unit diaphragm, the pressure relief valve is quickly opened and the pressure is released into the atmosphere. Damage to the ~~diaphragm electrode units~~ membrane electrode assemblies of the fuel cells is thus prevented. The pressure relief valve may be controlled by an actuator whose actuating signals are formed in a control device using sensors which detect the pressure on the low-pressure side of the reformer unit diaphragm or the carbon monoxide or carbon dioxide concentration. A bursting disk may also be provided instead of the pressure relief valve. If it is anticipated that, in the event of a malfunction, pressure equalization does not take place quickly

enough, pressure equalization in the anode space of a fuel cell may be delayed via a flow resistance, the flow resistance being situated upstream from the anode space.

Please replace paragraph **[0021]** of the specification with the following amended paragraph:

[0021] Figure 2 shows a schematic representation of a protection system for a ~~diaphragm electrode unit~~ membrane electrode assembly using a bursting disk,

Please replace paragraph **[0026]** of the specification with the following amended paragraph:

[0026] Fuel cell unit 2 contains a fuel cell battery made up of fuel cell modules. Figure 1 shows only one fuel cell module composed of an anode side 18 and a cathode side 19 which are separated from one another by a ~~diaphragm electrode unit~~ membrane electrode assembly 20. Anode side 18 is connected to the low-pressure side of diaphragm module 4 via a line 21. A flow resistance 22 is integrated into line 21. On the inlet side, cathode side 19 is connected to a compressor 23 having a suction line 24. On the outlet side, anode side 18 and cathode side 19 are connected respectively to line 21 and water tank 10. Two current leads 25, 26 run from ~~diaphragm electrode unit~~ membrane electrode assembly 20 to a consumer 27.

Please replace paragraph **[0029]** of the specification with the following amended paragraph:

[0029] If diaphragm 14 in diaphragm module 4 bursts, a new pressure balance occurs in high-pressure area 15 and low-pressure area 16. In this event of malfunction, the high-pressure from high-pressure area 15 is released into low-pressure area 16. Without the measures according to the present invention, a differential pressure would exist between anode side 18 and cathode side 19 of fuel cell unit 2, which would result in damage to ~~diaphragm electrode unit~~ membrane electrode assembly 20.

Please replace paragraph **[0030]** of the specification with the following amended paragraph:

[0030] Different measures according to the present invention are implemented which, individually or in combination, prevent the destruction of ~~diaphragm electrode unit~~ membrane electrode assembly 20.

Please replace paragraph **[0031]** of the specification with the following amended paragraph:

[0031] As a first measure, the volumes in high-pressure area 15 and low-pressure area 16 may be dimensioned such that, in the event of diaphragm 14 bursting, a mixture pressure is established which is lower than the critical overpressure toward cathode side 19. This may be achieved by dimensioning the volume in high-pressure area 15 as small as possible compared to the volume of low-pressure area 16. If the volume in low-pressure area 16 is dimensioned to be six to eight times larger than in high-pressure area 15, then, in the event of diaphragm 14 bursting, a pressure increase by a factor of only 1.4 to 1.1 results in the total volume formed from the volumes of reformer 3, diaphragm module 4, anode side 18 of fuel cell unit 2, and the associated pressure-connected elements such as line 21, sensor 28, pressure relief valve 29, and flow resistance 22. This moderate pressure increase poses no danger for ~~diaphragm electrode unit~~ membrane electrode assembly 20.The pressure differential between anode side 18 and cathode side 19 of fuel cell unit 2 does not exceed a critical threshold of typically 500 mbar.

Please replace paragraph **[0032]** of the specification with the following amended paragraph:

[0032] As a further measure, the signal of sensor 28 may be used for detecting the ruptured state of diaphragm 14. Bursting of diaphragm 14 results in rapid pressure increase in low-pressure area 16 which may be detected by sensor 28 which responds to rapid pressure changes. When diaphragm 14 bursts, the reformer gas continues to flow unobstructed into anode side 18 of fuel cell element 2. However, the reformer gas contains a high concentration of carbon monoxide and

carbon dioxide which is detectable by a sensor 28 for detecting carbon monoxide or carbon dioxide. The signal of sensor 28 is analyzed in control device 31 and an actuating signal is generated for actuator 30. Signal processing in control device 31 takes place at such high speed that the overpressure in low-pressure area 16 is reliably reduced. The actuating signal at actuator 30 causes a rapid opening of pressure relief valve 29. The pressure increase cannot continue to anode side 18, whereby ~~diaphragm electrode unit~~ membrane electrode assembly 20 is protected.

Please replace paragraph **[0033]** of the specification with the following amended paragraph:

[0033] A variant having a bursting disk 36 in line 21 is shown in Figure 2. Otherwise, the fuel cell system has the design described in Figure 1. Bursting disk 36 functionally substitutes sensor 28 and pressure relief valve 29 of Figure 1. At an unacceptably high pressure, such as occurs in low-pressure area 16 when diaphragm 14 is ruptured, bursting disk 36 is ruptured so that the overpressure dissipates into the atmosphere. As described in connection with Figure 1, the pressure increase cannot continue to anode side 18, whereby ~~diaphragm electrode unit~~ membrane electrode assembly 20 is also protected.

Please replace paragraph **[0034]** of the specification with the following amended paragraph:

[0034] In the method as recited in Claim 1, as well as in the method as recited in Claim 2, flow resistance 22 is used to prevent damage to ~~diaphragm electrode unit~~ membrane electrode assembly 20 while pressure decreases. In the event of rupture of diaphragm 14, flow resistance 22 causes a delay of pressure equalization on anode side 18 of fuel cell unit 2. Fuel cell unit 2 is operated at low pressure, i.e., the volume flow in stationary normal operation is proportional to the hydrogen consumption on anode side 18. Because the volume flow in high-pressure area 15 contains all remaining gases in addition to unseparated hydrogen, the volume flow is substantially larger than in low-pressure area 16. According to the general gas law, the volume flow in the high-pressure area is accordingly small under high operating pressure. When diaphragm 14 bursts, the volume flow in the event of malfunction is released into anode side 18

of fuel cell unit 2 and thereby increases. Flow resistance 22 is designed in such way that it allows for a minimal pressure drop during normal operation and a very high pressure drop in the event of damage in order to be able to dissipate the gas flow in space and time via pressure relief valve 29 or bursting disk 36 and to simultaneously ensure minimal pressure increase in anode side 18.

Please replace paragraph **[0035]** of the specification with the following amended paragraph:

[0035] Based upon Figure 3, a further measure involving active anode protection is explained. The fuel cell system shown in Figure 3 essentially represents the system shown in Figure 1, with the exception that, instead of flow resistance 22, a controllable valve 37 having an actuator 38 is provided in line 21. As described above, rupture of diaphragm 14 is detected by sensor 28. The signal of sensor 28 is processed in control device 31. Actuating signals for actuators 30, 38 are generated in control device 31. The actuating signal at actuator 38 initially causes valve 37 to be shut off thereby interrupting the connection between anode side 18 and diaphragm module 4 and protecting ~~diaphragm-electrode unit~~ <u>membrane electrode assembly</u> 20. Pressure relief valve 29 is simultaneously or subsequently opened via the actuating signal at actuator 30 so that the gas mixture is blown off into the atmosphere. Of course, pressure relief valve 29 and valve 37 may be combined into a three-way valve so that the hydrogen path is diverted directly into the atmosphere.

Please replace paragraph **[0037]** of the specification with the following amended paragraph:

[0037] All measures for protecting ~~diaphragm-electrode unit~~ <u>membrane electrode assembly</u> 20 have in common the fact that in the event of rupture of diaphragm 14 the supply of non-reformed fuel such as methane, methanol, diesel, or gasoline, as well as the supply of water and air are interrupted by control device 31 which, if needed, shuts off valves 6, 9 and/or shuts down compressors 12, 23. This reliably prevents ~~diaphragm-electrode unit~~ <u>membrane electrode assembly</u> 20 from bursting or being contaminated.